State of Illinois
Department of Registration and Education
STATE GEOLOGICAL SURVEY DIVISION
John C. Frye, Chief

GUIDE LEAFLET

GEOLOGICAL SCIENCE FIELD TRIP

Sponsored by
ILLINOIS STATE GEOLOGICAL SURVEY

VALMEYER AREA

Monroe and St. Clair Counties

Kimmswick, Waterloo, and New Athens Quadrangles

Leaders
Edgar Odom, George M. Wilson, Guy Dow

Urbana, Illinois
October 14, 1961

GUIDE LEAFLET 1961F

HOST: Valmeyer High School

To the Participants:

It has been said that the landscape is truly beautiful only when we intelligently understand the varied forces that have worked through the ages to develop it. The result of this understanding is increasing enjoyment and appreciation of the natural features about us.

The Geological Science Field Trip program is designed to acquaint you with the landscape, rock and mineral resources, and the geological processes that have led to their origin. With this program, we hope to stimulate a general interest in the geology of Illinois and a greater appreciation of the state's vast mineral resources and their importance to the over-all economy.

We encourage you to ask the tour leaders any questions that may occur to you during the trip. Discussion often clarifies points that otherwise would remain confused to many of the participants. We also invite your written comments upon the conduct of the trip so that we might improve them as much as possible.

Additional copies of this guide leaflet, as well as itineraries for trips that have been held in the past, may be obtained free of charge by writing to the Illinois State Geological Survey. Maps are available for 30 cents each.

We hope you enjoy today's trip and will come again.

THE VALMEYER GEOLOGICAL SCIENCE FIELD TRIP

ITINERARY

Suggestion: Have someone read the guide as we travel through the countryside so that the driver will be able to learn the geology of the area, also.

Abstract

The Valmeyer area has a wide range of geologic features. Virtually the entire Middle Mississippian Valmeyerian Series, including the Fern Glen, Burlington-Keokuk, Warsaw, Salem, and St. Louis Formations, is exposed at Valmeyer.

The Valmeyer Anticline, an interesting structural feature, brings to the surface the Plattin, Kimmswick, Fernvale, and Maquoketa Formations of Ordovician Age.

Participants will tour the Columbia Quarry, an underground mine working the pure Kimmswick Limestone. The Dupo Anticline and the theory of anticlinal oil traps are discussed.

Some geomorphological features include flood plain features, loess bluffs, and karst topography. Illinoian glacial till is exposed just west of Waterloo.

Fossils abound in the Okaw Limestone quarried at Hecker. The Okaw is a member of the Chester Series of Upper Mississippian Age.

Suggested References for Further Study of the Geology of the Field Trip Area

1. Baxter, James. Salem Limestone in Southwestern Illinois. Illinois State Geological Survey Circular 284, 1960.

2. Illinois Petroleum No. 18, 1929. Publication of the Illinois State Geological Survey.

3. Weller, Stuart and Weller, J. Marvin, Preliminary Geologic Maps of the Pre-Pennsylvanian Formations in Part of Southwestern Illinois. Illinois State Geological Survey Report of Investigation No. 59, 1939.

0.0 0.0 West side of Valmeyer High School, heading south

0.1 0.1 STOP. Turn left. (east)

0.5 0.4 Valmeyer Business District.

0.6 0.1 CAUTION. Missouri Pacific Railroad tracks.

0.7 0.1 Continue straight ahead, east off Highway 156.

0.9 0.2 Slow, turn left on gravel road that parallels river bluff.

1.0 0.1 STOP. Turn right on Highway 156.

1.1 0.1 STOP 1. Steeply dipping beds on west flank of Valmeyer Anticline.

We are on the southwestern flank of the Valmeyer Anticline. An anticline is an upfold of originally horizontal rock strata. The line about which the beds are folded is the axis and the direction which the axis takes on a map is called the strike. Conventionally, the strike is read in angles east or west of north. The Valmeyer Anticline strikes north, 48 degrees west. The axial plane of a fold is an imaginary plane which contains the fold axis and which most nearly divides the fold into two equal parts or limbs. The intersection of any bed with the axial plane is the axis of the fold for that bed.

The Valmeyer Anticline is an asymetrical fold in which the beds dip steeply (33 degrees max.) on the southwestern limb and very gently (less than 2 degrees) on the northeastern limb. We will see the gently dipping beds on the northeast limb later today.

In an anticline, the oldest rocks are found at the center of the fold and they become progressively younger toward the limbs. A syncline, or down fold, gives just the opposite effect. At Stop 2 we will discuss the rocks which are involved in the folding of the Valmeyer Anticline. Figure I will help in visualizing the various components of anticlines and synclines.

1.1 0.0 SLOW. Turn left on road to Columbia Quarry.

1.3 0.2 Note loess exposures on right.

1.4 0.1 SLOW. Turn right and ascend hill.

1.5 0.1 Note thick loess deposits on left.

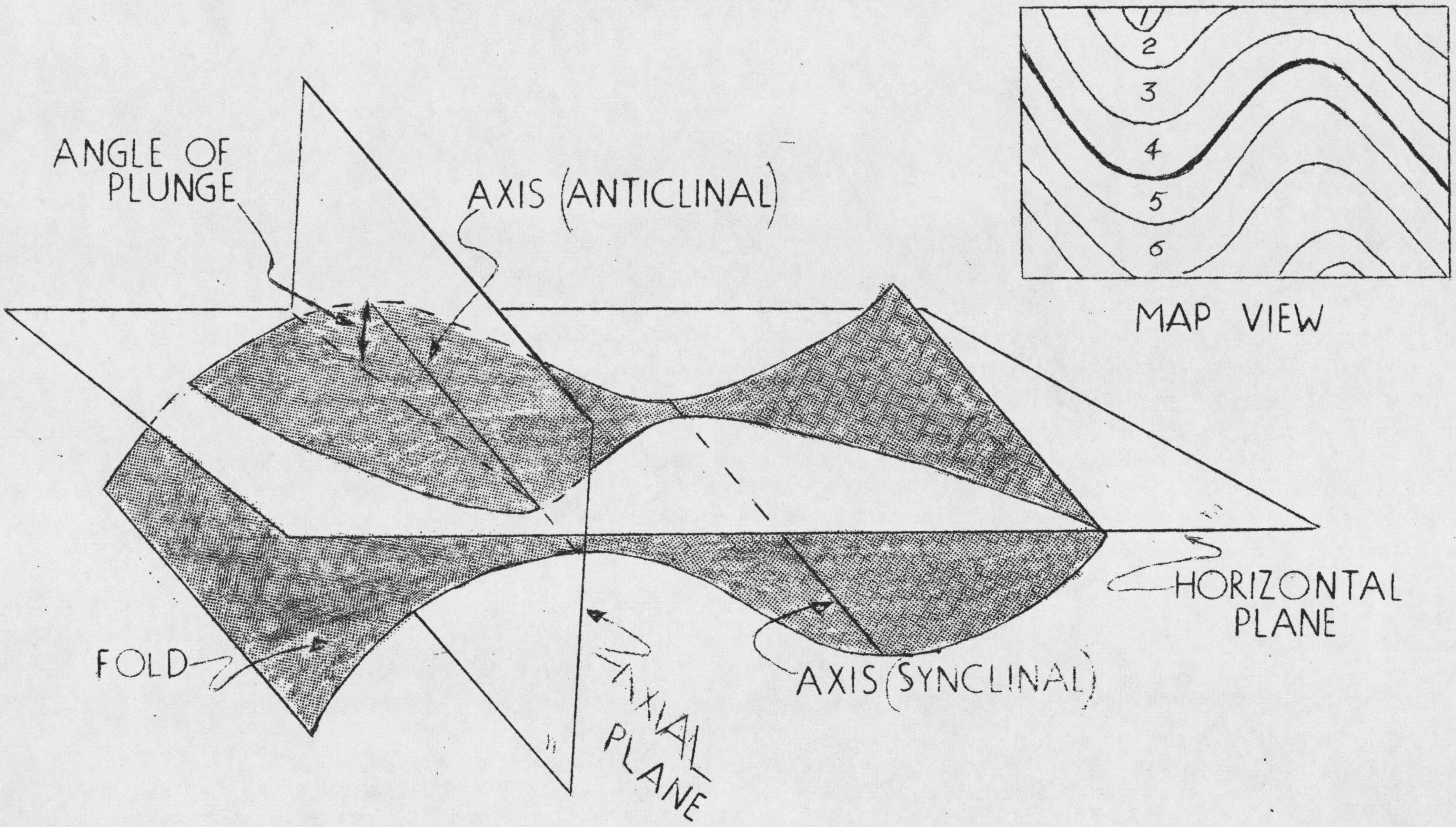
1.6 0.1 Entering Valmeyer Quarry of the Columbia Quarry Company.

1.7 0.1 SLOW. Turn right.

1.9 0.2 Entrance to the underground workings of the Columbia Quarry Company.

1.9 0.0 SLOW. Turn left.

2.0 0.1 Leaving underground workings of Columbia Quarry Corporation.



1
2
3
4
5
6
MAP VIEW
ANGLE OF PLUNGE
AXIS (ANTICLINAL)
HORIZONTAL PLANE
FOLD
AXIAL PLANE
AXIS (SYNCLINAL)

FIG. 1

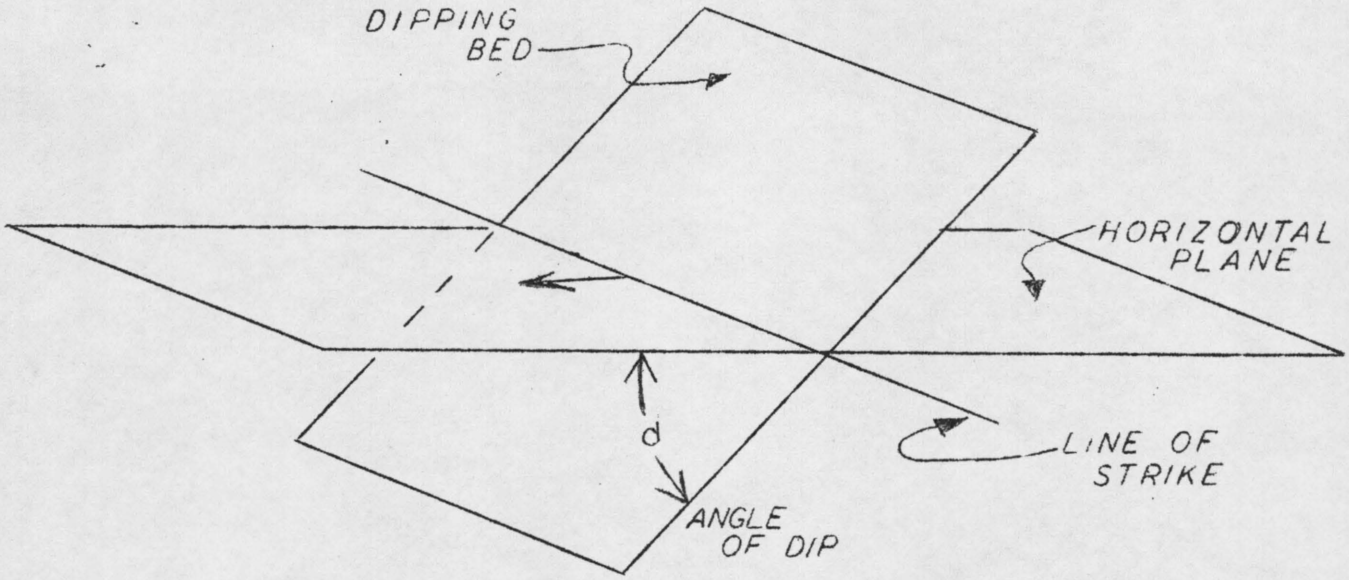


FIG. 2

EXPLANATION OF FIGURES 1 and 2

Fig. 1 is a diagrammatic depiction of an anticline and syncline consisting of only one rock stratum. The Map View shows how the fold would look from above. The heavy line corresponds to the intersection of the bed in the diagram with the horizontal or ground plane. Other beds have been added to show that the oldest beds are in the center of the anticline and the opposite in the syncline. The beds are numbered from oldest to youngest.

Fig. 2. shows the relationship between "dip" and "strike." The strike is the azimuth or compass direction with respect to north of the line of intersection of a dipping bed with the horizontal(generally the ground). The dip, or true dip, is the angle of inclination of a bed with respect to a horizontal plane. True dip must be measured perpendicular to the strike. The apparent dip is the angle of inclination measured from some angle to the strike. Can the apparent dip ever be larger than the true dip? What is the strike of a horizontal bed?

2.2 0.2 STOP 2. Discussion of Valmeyer Anticline and Quarrying Operations of Columbia Quarry Company.

The Valmeyer Anticline extends in a southeasterly direction from the Mississippi River bluffs at Salt Lick Point, just above Valmeyer, to a point southeast of Mayestown where it plunges beneath the surface. Up to this point, it is easily recognized in all ravines crossing its axis. The oldest rocks in the region have been elevated in the axis of the anticline and exposed at the surface through deep erosion of the Mississippi River Valley and tributary ravines. These rocks belong to the Ordovician System.

The rocks exposed in the anticline are described here in the order oldest to youngest.

ORDOVICIAN

Plattin Limestone: Only the top-most portion is exposed in the base of the bluff near the Valmeyer quarry.

Kimmswick Limestone: Very pure, light colored, often nearly white, sometimes flesh colored, crystalline limestone with very little chert. The fossil sponge, *Receptaculites oweni*, is found only in the Kimmswick and stratagraphically equivalent formations. This is the quarry rock in the Valmeyer quarry. A little over 100 feet is exposed here. The rock is quarried in a system of large rooms cut in the hillside. These rooms form a continuous network at several levels and extend back for approximately one-half mile beneath the ground. Because of the purity of the Kimmswick Limestone, the Columbia Quarry of Valmeyer is a major supplier of limestone for chemical purposes.

Fernvale Limestone: A very thin, usually less than two feet, impure, cherty, brown limestone lying directly on top of the Kimmswick.

Maquoketa Shale: A fine, olive green shale which, because of its low resistance to erosion, forms slopes rather than cliffs. Locally, it may grade into a granular, shaly dolomite.

MISSISSIPPIAN

Fern Glen Formation: Largely limestone, locally shaly, with lenses and continuous chert bands in the upper portions. Characterized by its deep red color, it grades into greenish beds near the top of the formation. The Fern Glen marks the base of the Mississippian rocks in the region and lies directly upon the vastly older Maquoketa Shale of Ordovician age. Such a contact is called an uncomformity and the lost interval is called an hiatus. The hiatus here represents all of the Silurian and Devonian periods. Evidence from wells indicate that at least some of these missing rocks were deposited but have been eroded away sometime before the transgression of the Mississippian seas into the Valmeyer region. It is interesting to note that the older beds lie parallel to the younger beds. Such a parallel relationship shows that the Valmeyer Anticline was formed sometime after the deposition of the youngest beds.

Burlington Limestone: A relatively thick sequence of thick chert bands with white crystalline limestone sandwiched between the chert layers. Weathered exposures commonly consist of porous chert from which the soluble limestone has dissolved out. The limestone never comprises more than 50 per cent of the rock and in places probably constitutes as little as 20 percent of the mass of the formation.

Keokuk Limestone: A cherty limestone similar to the Burlington.

Warsaw Formation: Shales and calcareous shales and interbedded limestones of greater or less thickness than the shales. The Warsaw contains a narrow zone (one to a few feet thick) characterized by the two large brachiopods, *Spirifer washingtonensis* and *Productus magnus*. This faunal zone lies within a few feet of the dividing line between the Warsaw and overlying Salem Limestone. There is no break in sedimentation between the two formations, although the transition is accomplished within a very few feet. This transition from one formation to another without a break illustrates one of the most fundamental principles of geology yet is one of the most frequently overlooked. This principle is that deposition has been continuous throughout most of geologic time and hiatuses occur most commonly within geologic periods rather than between them. Most unconformities are localized features and do not reflect the prevailing conditions over a wide area. The punctuation of the geologic periods is now based upon the fossil record rather than upon major episodes of crustal unrest and mountain building as was done formerly.

Salem Limestone: This rock is composed of relatively pure nonargillaceous limestone. Fragments of macrofossils, microfossils, and oolites in a calcareous matrix characterize the Salem Limestone.

St. Louis Limestone: Because of its position high in the stratigraphic column and, consequently, situated on the outermost flanks of the Valmeyer Anticline, the St. Louis Limestone underlies a much larger area than any of the other formations discussed so far. The reason for this will become apparent upon careful examination of Fig. 3. The rock is a light colored (gray, bluish gray, or in places nearly white), dense, fine-textured limestone. Beds vary from a few inches to several feet in thickness. Green shale partings are present between some beds and locally shaly limestone beds are present. Some brittle chert occurs in horizontal bands.

2.3 0.1 STOP 3. Discussion of Use Being Made of Abandoned Underground Workings.

These abandoned underground workings make ideal places to grow mushrooms. The Knast Mushroom establishment has taken advantage of the natural conditions of darkness, coolness, and dampness of these bedrock rooms. This is an example of multiple use for abandoned mineral producing areas. The creation of the underground cavities by the quarrying of limestone made it possible to establish a different type of industry.

2.3 0.0 Entering underground workings of Columbia Quarry Company.

2.4 0.1 Crushing equipment. Stone is dumped at this point for crushing and further preparation.

2.5 0.1 Turn right immediately after re-entering underground workings.

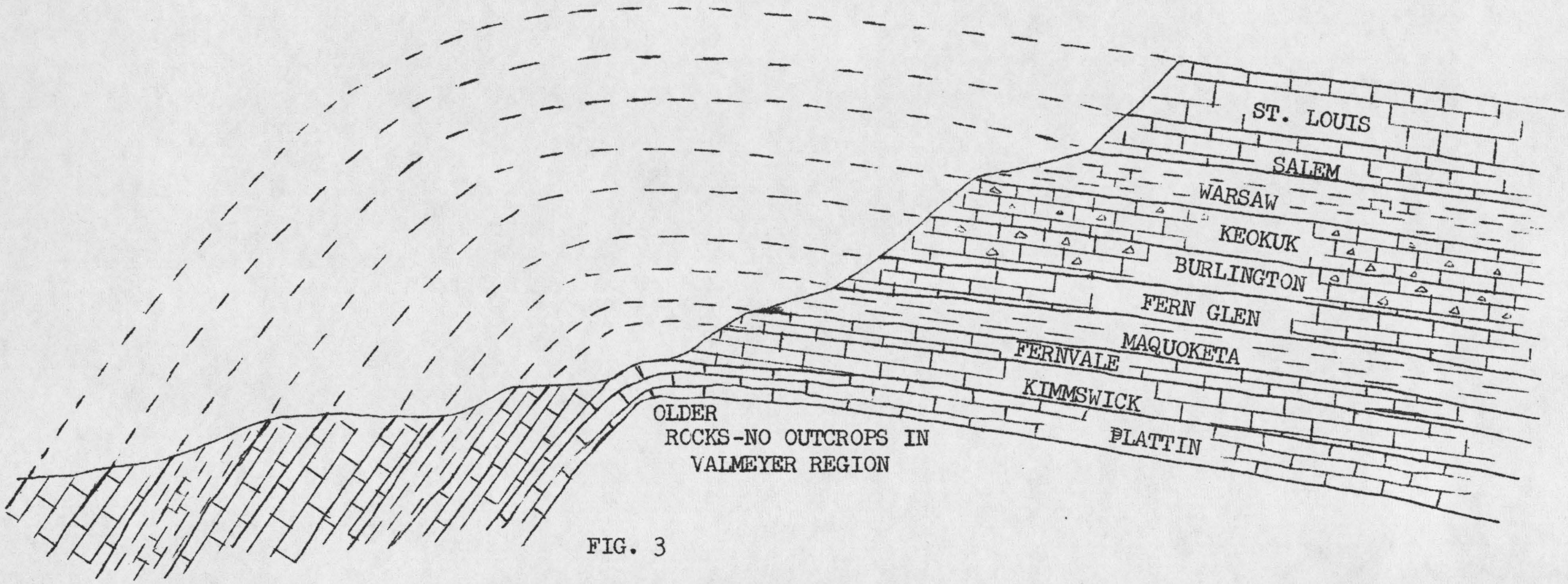


FIG. 3

Cross-section through Valmeyer anticline showing the formations that outcrop in the Valmeyer region. Note how the resistant limestones form steep bluffs whereas the weak shales of the Maquoketa and Warsaw Formations become slopes. The dotted lines show how the fold looked before erosion.

2.6 0.1 STOP. Emerging from underground workings. Turn right. Follow hard blacktop road to quarry preparation plant.

2.8 0.2 SLOW. Railroad tracks.

2.8 0.0 Offices of Columbia Quarry Company.

3.0 0.2 EXTREME CAUTION. Missouri Pacific Railroad tracks.

3.0 0.0 STOP 4. View of Mississippi River Bluff Showing Kimmswick and Overlying Mississippian Formations.

The general outlines of the Valmeyer Anticline can be seen here. Note that there is a slope between the Mississippian limestones and Ordovician Kimmswick Limestone. This slope is formed in the weak Maquoketa Shale of Ordovician age. The resistant limestones tend to be cliff formers. A conspicuous slope is also developed in the Warsaw Formation between the Keokuk-Burlington and Salem-St. Louis Limestones. The Warsaw slope is not seen at this stop.

Besides affording an excellent view of bedrock structures, this stop enables us to examine some of the features peculiar to river valleys. Rivers, at certain stages in their development, tend to wander across their valleys in a series of loops and curves called meanders. Meandering and repeated flooding give rise to many interesting features. Most of the flood-plain features are difficult to see at ground level, but detailed mapping brings them out and aerial photographs show them especially well.

Water flowing through a meander curve is forced against the outside bank called the cut, or undercut bank. As the cut bank is eroded back, the water in the channel migrates in this direction leaving a slip-off slope on the inside of the curve. Deposition of material may occur on the slip-off slope in crescent shaped forms which, when incorporated into the flood-plain, become flood-plain scrolls. Meanders move across the valley and also down stream. Abandoned meanders generally leave evidence of existence in the form of meander scars. The area within a meander curve is called the spur and the narrow portion is called the neck. At times of high water, the river may cut off the meander through the neck leaving a meander core. If water is left in the cut off meander, it is called an oxbow lake. Mordock Lake is a crescent shaped lake formed in this manner. If the river cuts through channel bars or point bars, which form on the slip-off slope, then it is called a chute cut off.

During floods, great quantities of material (especially the coarser material) is dumped when the river suddenly loses its velocity as it goes over the banks. This material piles up, forming ridges or natural levees along the stream banks. The remaining material is spread out over the valley floor forming a flood-plain. Each time that the river floods the levee is built higher, but at the same time the river bottom is built up to match the increased height of its banks. When a levee breaks through at an isolated point, the break is called a crevasse. Water flowing through a crevass quickly loses velocity upon debouching upon the flood plain and forms a fan-shaped deposit. The escaping stream is broken up into several branching channels which spread the sediment into a fan. Figure 4 will help clarify the preceding discussion.

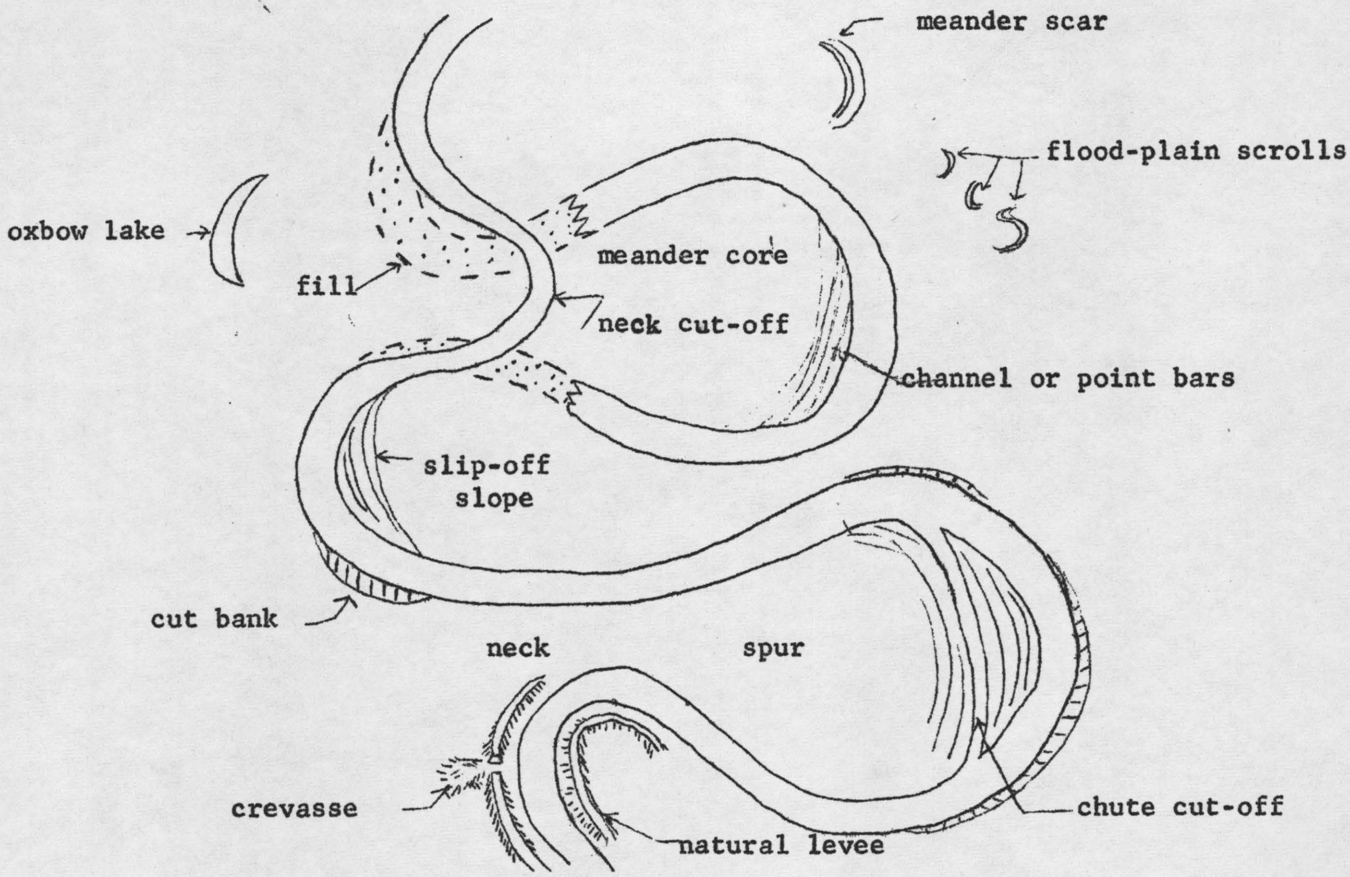


Figure 4

Flood-Plain Features

3.0	0.0	Turn left (south).
3.1	0.1	Entering Valmeyer
3.3	0.2	Mordock Lake on right. This is an abandoned meander of the Mississippi River, technically called an Ox Box Lake.
3.7	0.4	STOP. Highway 156. Turn right and return to Valmeyer High School.
3.9	0.2	Turn right on street at east side of Valmeyer High School.
4.0	0.1	Turn left on road that runs behind the high school.
4.2	0.2	SLOW. Turn left on road on west side of Valmeyer High School.
4.2	0.0	STOP 5. Lunch. Valmeyer High School.
4.3	0.1	STOP. Highway 156, turn left (east).
4.6	0.3	Entering business district of Valmeyer.

4.8 0.2 SLOW. Missouri Pacific Railroad Tracks.

4.9 0.1 SLOW. Turn left on Highway 156.

5.2 0.3 Bridge. Continue ahead on Highway 156.

5.5 0.3 Entering Dennis Hollow. The following rock sequence is exposed here.

ORDOVICIAN:

Kimmswick Limestone
Fernvale Limestone
Maquoketa Shale

MISSISSIPPIAN:

Fern Glen Formation
Burlington Limestone
Keokuk Limestone
Warsaw Formation
Salem Limestone
St. Louis Limestone

5.6 0.1 Kimmswick Limestone on right and left.

5.7 0.1 This is approximately the crest of the Valmeyer Anticline.

5.9 0.2 The covered interval in this region is part of the Maquoketa Shale Formation.

6.1 0.2 Red Fern Glen Shale and Limestone exposed on right overlain by Burlington Limestone and Chert. This is the Lower Mississippian in this part of Illinois.

6.2 0.1 Note that beds dip gently to the east.

6.3 0.1 Small subsidiary fold in the Keokuk-Burlington sequence on left.

6.4 0.1 Burlington-Keokuk Limestone and Chert exposed in cut on left.

6.6 0.2 Upper beds of the Keokuk Formation on the left.

6.7 0.1 Warsaw Limestone and Shale exposed on the left.

7.5 0.8 Thick limestones of the St. Louis and Salem Formations underlie this region. Along the outcrop of the formations there is a prominent development of karst topography.

8.1 0.6 Bridge over Bond Creek.

8.7 0.6 Large water-filled sink hole on right.

9.2 0.5 Large dry sink hole on right and left.

9.3 0.1 Large water-filled sink hole on right.

9.9 0.6 Entering village of Foster Pond.

10.2 0.3 Note small depressions in the fields. These are evidences that the development of karst is still actively in process.

10.5 0.3 Large water-filled sink hole in front of house on left.

10.9 0.4 STOP 6. Group of Coalescing Sink Holes on Right.

The numerous circular depressions, some dry and others filled with water, that occur extensively in the area are sinkholes formed by solution of the limestone which underlies the area. The topography produced is called karst topography.

Sinkholes develop in regions underlain by thick, highly jointed limestone and are solution cavities produced by the attack of soil water. Rain water becomes slightly acid when it comes into contact with decaying organic material in the soil. The acid soil water enters joints or cracks in the limestone and takes the calcium carbonate of the limestone into solution. This process of solution widens the joints, and, with time, the joints begin to collapse and surface water is directed into the widened joints. Further collapse and solution produce the circular depressions that characterize sinkhole country.

Soil and other debris often plug the subterranean outlet of sink holes to form ponds. These ponds may abruptly disappear as the outlet is opened by further solution or water pressure.

There are four prerequisites for maximum karst development. First, there must be present at or near the surface a soluble rock. Secondly, and one of the most important factors, this soluble rock should be dense, highly jointed, and preferably thin bedded. A highly permeable rock is unfavorable because the rainfall will be absorbed and move through the whole body of the rock rather than concentrate along joint and bedding planes. Permeability as permitted by numerous joints and bedding planes is very favorable if the rock is soluble. The Ste. Genevieve and St. Louis Limestones of Mississippian Age which underlie this upland region are soluble, relatively dense, and highly jointed.

A third condition essential to karst development is that there exist an entrenched major valley below uplands underlain by soluble limestones. This condition is essential so that the water that enters and flows along the joint planes has an outlet. The Mississippi River is deeply entrenched below this limestone upland. Fourth and, finally, such a region should be one with at least a moderate amount of rainfall.

11.9 1.0 Descending hill into Fountain Creek Valley.

12.1 0.2 Bridge over Fountain Creek.

12.7 0.6 Between 20 and 40 feet of loess mantles the upland surface of this section of Monroe County.

14.2 1.5 <u>STOP 7</u>. Discussion of the Ice Age History and the Dupo Anticline.

In the Pleistocene Period (or "Great Ice Age"), North America experienced four successive glacial invasions, each separated by long intervals of mild climate. Of these four invasions, the earliest, the Nebraskan, may have extended southward to the vicinity of Pittsfield, in Pike County. The second, or Kansan invasion, moving down from the region east of Hudson Bay, did not reach the Valmeyer area.

When the Kansan ice sheet melted away, it left behind glacial drift, rock, and debris which mantled the surface and concealed the bedrock. There followed a long interglacial interval (the Yarmouthian Stage), which left its record in the form of old soils and weathered zones on and in the Kansan glacial drift. From the amount of weathering and leaching that affected the Kansan drift, the length of the Yarmouthian Interglacial Stage is estimated at from 200,000 to 300,000 years.

The Yarmouthian Interglacial Stage was terminated by the advance of a new glacier from a center of accumulation east of Hudson Bay. This Illinoian Ice Sheet is well named, for not only did it cover nearly all of Illinois, but its western termination coincides closely with the western boundary of the State. The Illinoian is the only glacier that covered the Valmeyer region.

After several thousands of years, climatic conditions caused the melting away of the Illinoian Ice Sheet. During this warm stage, the upper part of the Illinoian till was weathered and soil developed just as in the case of the preceding Yarmouthian interval. However, this action did not take place to the degree it did during the Yarmouthian, so that the post-Illinoian (Sangamonian) interval is estimated to have lasted about 150,000 years.

The Sangamonian interval was brought to a close by the fourth and final readvance of the glaciers. This Wisconsinan Ice Sheet never reached the Valmeyer area, but it left its mark on the region. The Mississippi and other streams were choked with sediment washed out from the ice fronts that stood to the north and east. The frigid blasts that whipped across these broad sand and mud flats caused violent dust storms. The dust accumulated on the uplands and covered the Illinoian drift and Sangamonian soils with a thick layer of loess. This ashy loess, over most of the upland, grades into the soil of the present day.

DUPO ANTICLINE

The Dupo Anticline averages a little over a mile wide and runs from St. Louis southward beyond Waterloo. It is similar to the Valmeyer Anticline in shape. The Dupo Anticline was once an important source of petroleum although production is now limited, it is being used for underground gas storage.

Oil is lighter than salt water. In porous rock layers underground, the oil slowly separates from the water and then migrates to the highest places in the porous stratum, just as cream seeks the highest place in a bottle of milk. For this reason, the oil in time rises into the crests of folds or domes to form "oil pools". Such pools are not cavernous openings but merely high places in a porous rock stratum.

The oil in the Dupo field comes from a porous zone in Ordovician, Kimmswick (or "Trenton") Limestone, which here lies about 600 feet below the surface. The pool was discovered in 1928 by studying the inclination of the strata. The present topography of hills and valleys has no relation to the location of oil pools, which depend entirely on the bedrock structure.

14.3 0.1 SLOW. Entering Waterloo. Population 3,700.

14.4 0.1 SLOW. Gulf, Mobile, and Ohio Railroad tracks.

14.8 0.4 SLOW. Turn left on Highway 156.

14.9 0.1 STOP. Turn right on Highway 156.

15.0 0.1 STOP. Junction Highway 3 and 156. Turn right on Highway 3 and 156.

15.4 0.4 SLOW. Turn left on Highway 156.

17.4 2.0 Note the general absence of sink holes in this area. The region between Waterloo and Hecker is underlain by limestones, shales, and sandstones of the Chester Series. The Chester Series of the upper Mississippian are the youngest rocks we have seen today. This type of rock sequence is not subject to karst development.

18.2 0.8 The fertile soils of the Waterloo area are developed in loess.

19.0 0.8 Note that surface streams are prevalent in this area. In the karst region west of Waterloo, few surface streams are present since most of the drainage is underground.

22,1 3.1 Outcrop of Chester Sandstone on right.

22.2 0.1 SLOW. Bridge over Richland Creek.

22.9 0.7 SLOW. Turn left on gravel road.

23.3 0.4 Turn right, then left.

23.9 0.6 T-road North--continue straight ahead.

25.2 1.3 SLOW. Turn left on Highway 156 and 159.

26.6 1.4 Turn right (east) on Highway 156.

27.2 0.6 SLOW.

27.3 0.1 Turn left into Hecker Quarry Incorporated.

27.5 0.2 STOP 8. Hecker Quarry.

After the deposition of the thick St. Louis-Ste. Genevieve Limestone, conditions of the crust in southern Illinois became more unstable so that only at times was the sea present, while alternately land conditions prevailed. Thus marine limestone and shale formations alternate with sandstone and shale formations of non-marine origin. This succession of limestone, sandstone and shale accumulated to a thickness of many hundreds of feet and is called the Chester Group.

The Okaw Limestone seen in the quarry belongs to this group. Like many Chester limestones, it teems with fossils, including many lacy bryozoa and the cork-screw Archimedes, as well as brachiopod shells, crinoidal fragments, Pentremites, and cup corals.

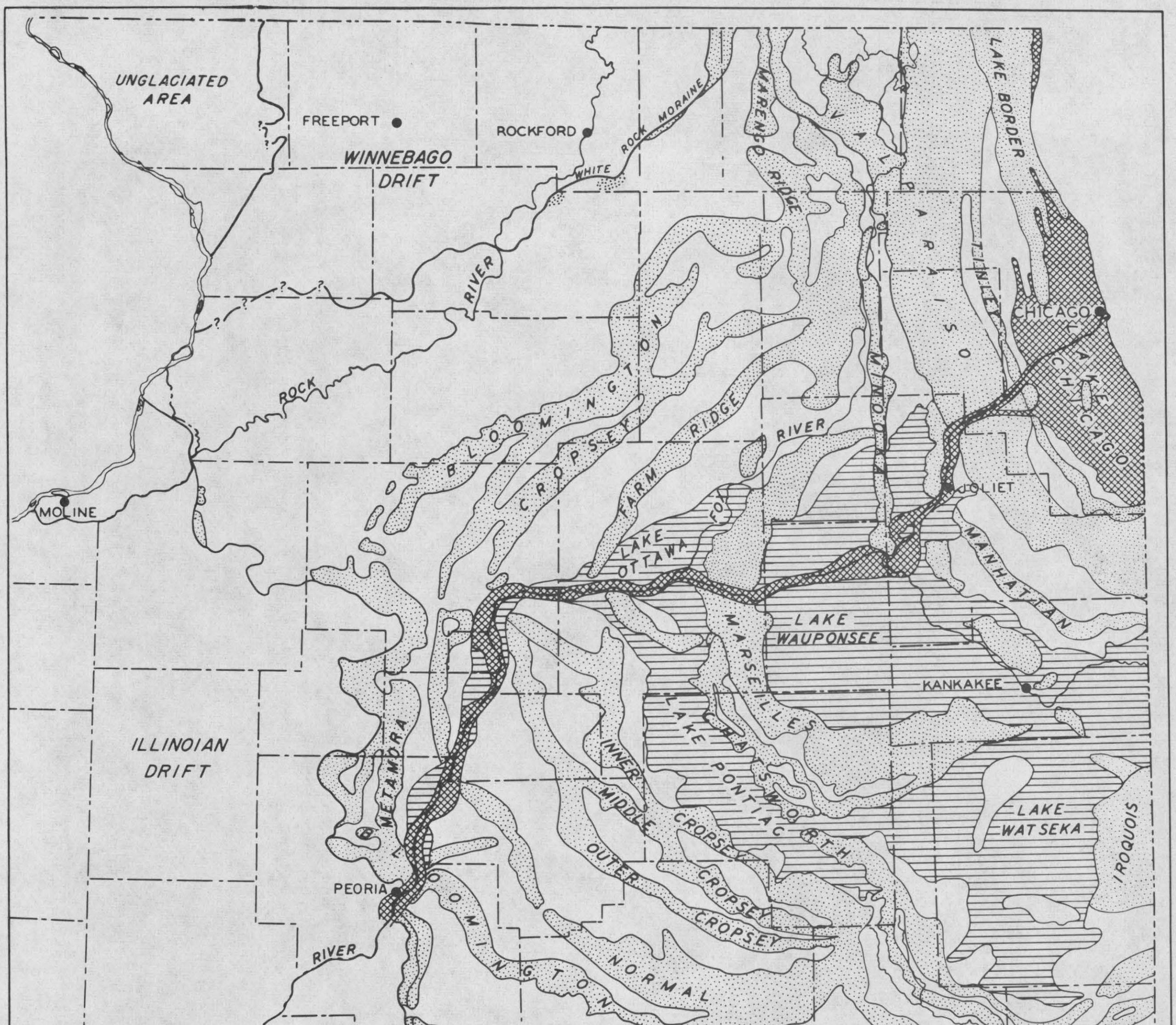
In the Valmeyer area, the Chester beds are absent because the strata were worn away by erosion before the deposition of the Pennsylvanian coal-bearing formations. These latter also have since been worn away from the Valmeyer region, although strip mining is carried on to the northeast in the vicinity of Millstadt.

GENERALIZED GEOLOGIC COLUMN
FOR THE VALMEYER AREA

ERAS	PERIODS	EPOCHS	FORMATIONS
Cenozoic	Quarternary	Pleistocene	(See detailed Time Table of Pleistocene).
	Tertiary	Pliocene Miocene Oligocene Eocene Paleocene	Present in extreme southern Illinois only
Mesozoic	Cretaceous		Present in extreme southern Illinois only
	Jurassic		Not present in Illinois
	Triassic		Not present in Illinois
Paleozoic	Permian		Not present in Illinois
	Pennsylvanian		Sandstones, siltstones, Shales, clays and coal to east
	Mississippian	Chesterian	Alternating sandstones, shales and limestones
		Valmeyerian	St. Louis Limestone Salem Limestone Warsaw Limestone and Shale Keokuk Limestone and Shale Burlington Limestone - cherty Fern Glen Limestone
		Kinderhookian	Shales locally
	Devonian		Limestone and sandstone in deep wells to east
	Silurian		Limestone and dolomite in deep wells to east
	Ordovician		Shales, limestone at Valmeyer. Sandstones & dolomites in deep wells
	Cambrian		No data
Proterozoic Archeozoic	Referred to as "Pre-Cambrian" time		

Time Table of Pleistocene Glaciation
(after M. M. Leighton and H. B. Willman, 1950, J. C. Frye and H. B. Willman, 1960)

Stage	Substage	Nature of Deposits	Special features
Recent	5,000 yrs.	Soil, youthful profile of weathering, lake and river deposits, dunes, peat	
Wisconsinan	Valderan 11,000 yrs.	Outwash	Glaciation in northern Illinois
	Twocreekan 12,500 yrs.	Peat, alluvium	Ice withdrawal, erosion
	Woodfordian 22,000 yrs.	Drift, loess, dunes lake deposits	Glaciation, building of many moraines as far south as Shelbyville, extensive valley trains, outwash plains, and lakes
	Farmdalian 28,000 yrs.	Soil, silt and peat	Ice withdrawal, weathering, and erosion
	Altonian 50,000 to 70,000 yrs.	Drift, loess	Glaciation in northern Illinois, valley trains along major rivers, Winnebago drift
Sangamonian (3rd interglacial)		Soil, mature profile of weathering, alluvium, peat	
Illinoian (3rd Glacial)	Buffalohartan	Drift	
	Jacksonvillian	Drift	
	Paysonian (terminal)	Drift	
	Lovelandian (Pro-Illinoian)	Loess (in advance of glaciation)	
Yarmouthian (2nd interglacial)		Soil, mature profile of weathering, alluvium, peat	
Kansan (2nd glacial)		Drift Loess	
Aftonian (1st interglacial)		Soil, mature profile of weathering, alluvium, peat	
Nebraskan (1st glacial)		Drift	



GLACIAL MAP OF NORTHEASTERN ILLINOIS

GEORGE E. EKBLAW
Revised 1960

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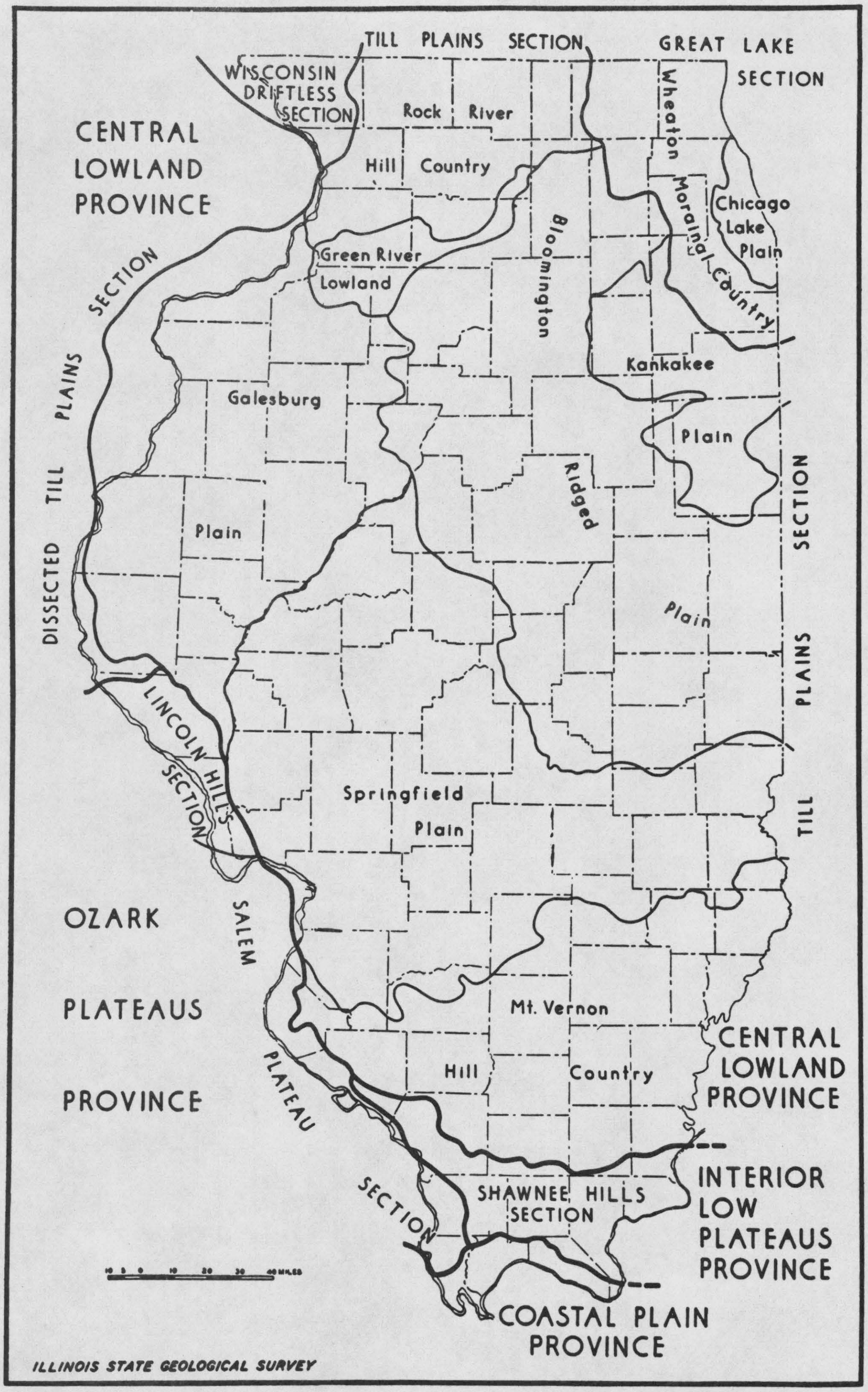
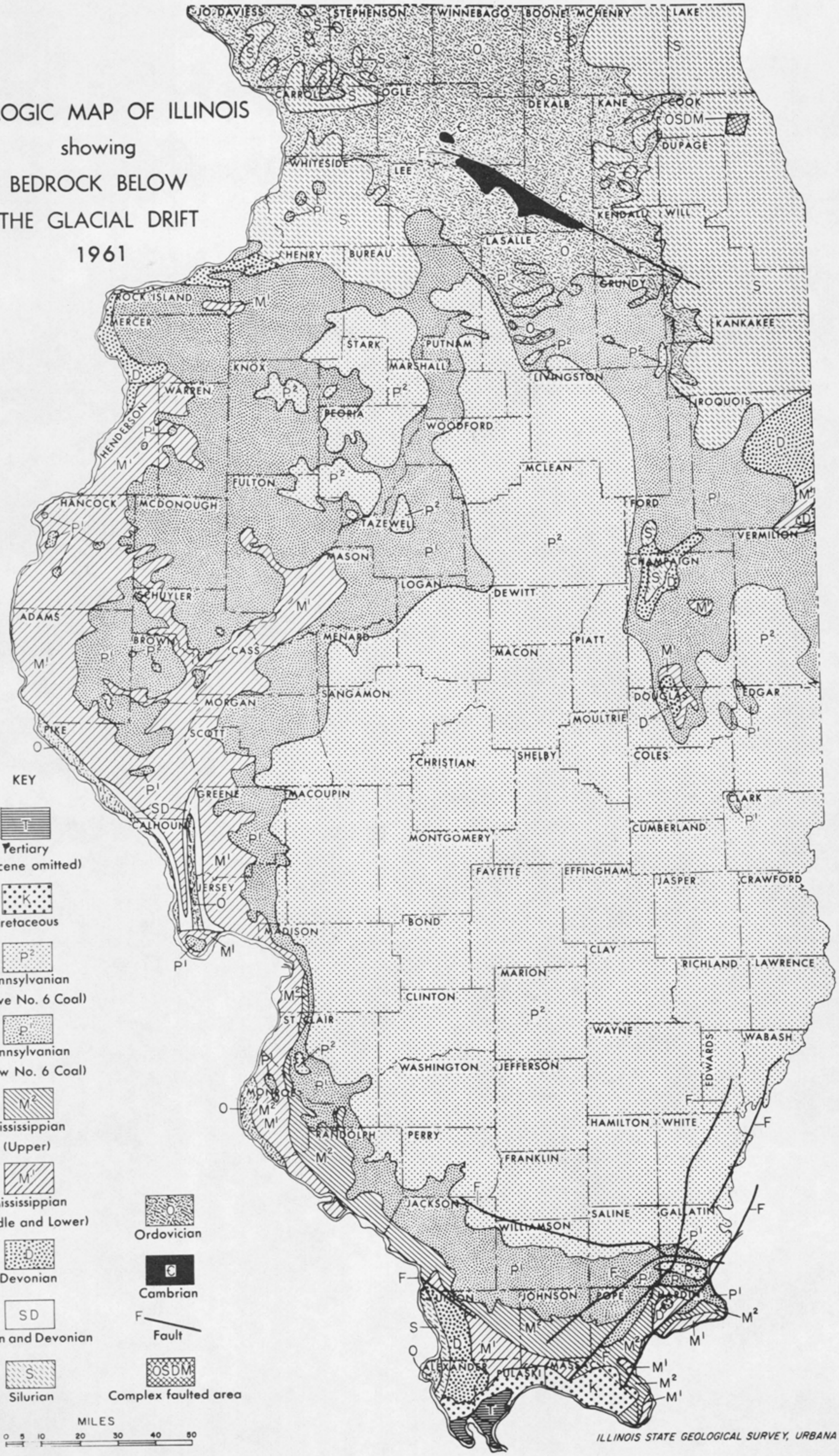


PHYSIOGRAPHIC DIVISIONS OF ILLINOIS

(Reprinted from Illinois State Geological Survey Report of Investigations 129, "Physiographic Divisions of Illinois," by M. M. Leighton, George E. Ekblaw, and Leland Horberg)

GEOLOGIC MAP OF ILLINOIS
showing
BEDROCK BELOW
THE GLACIAL DRIFT
1961



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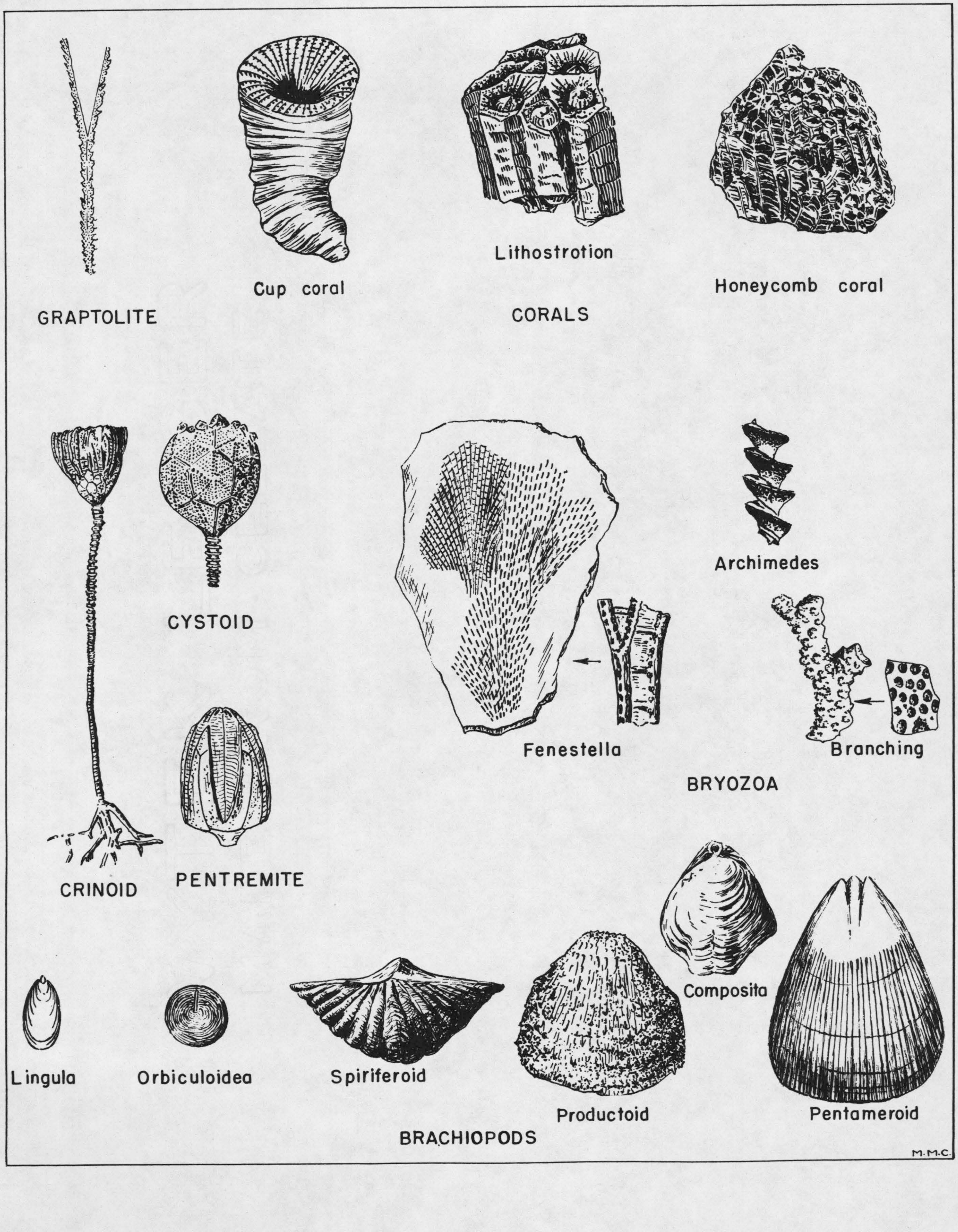
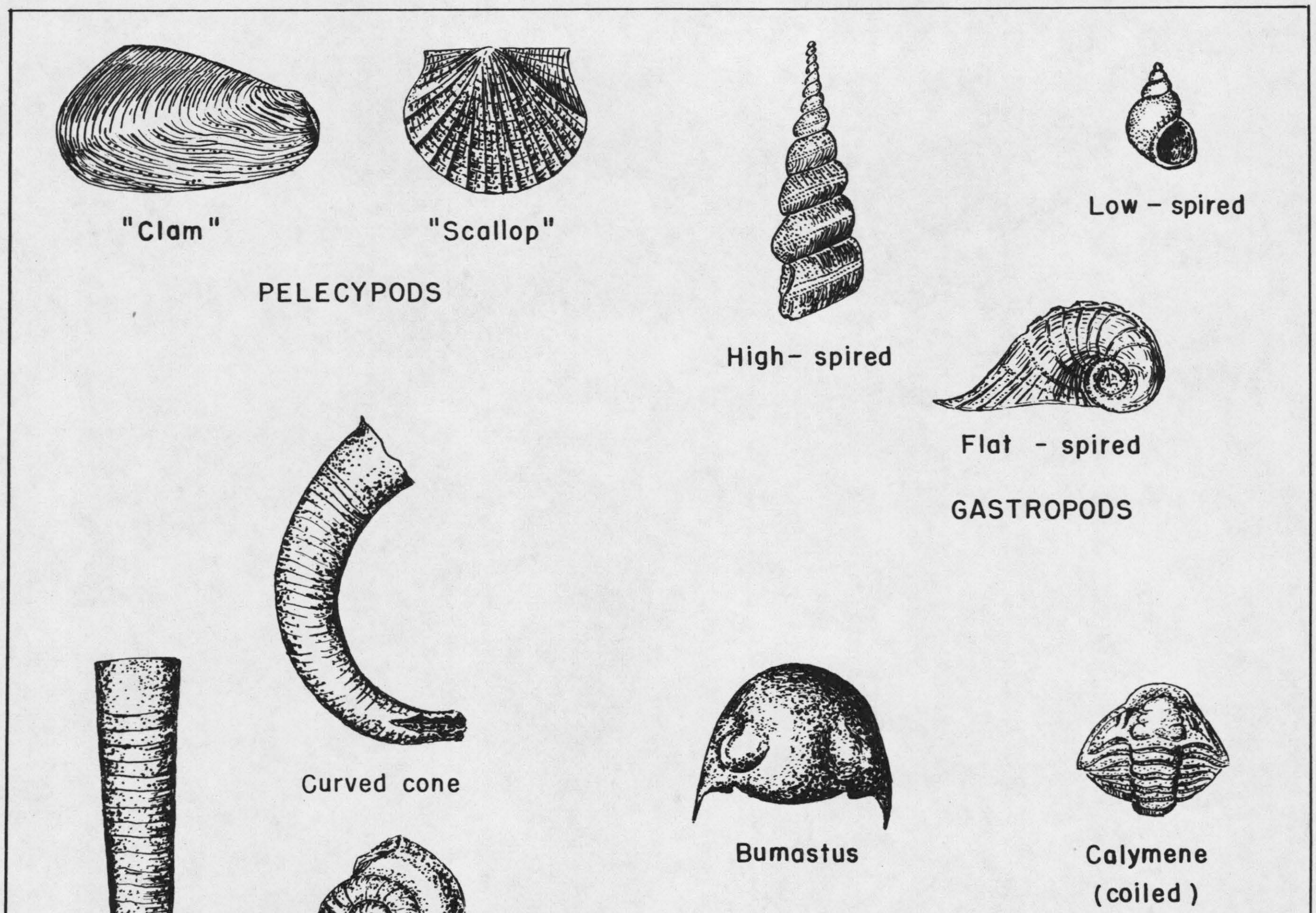
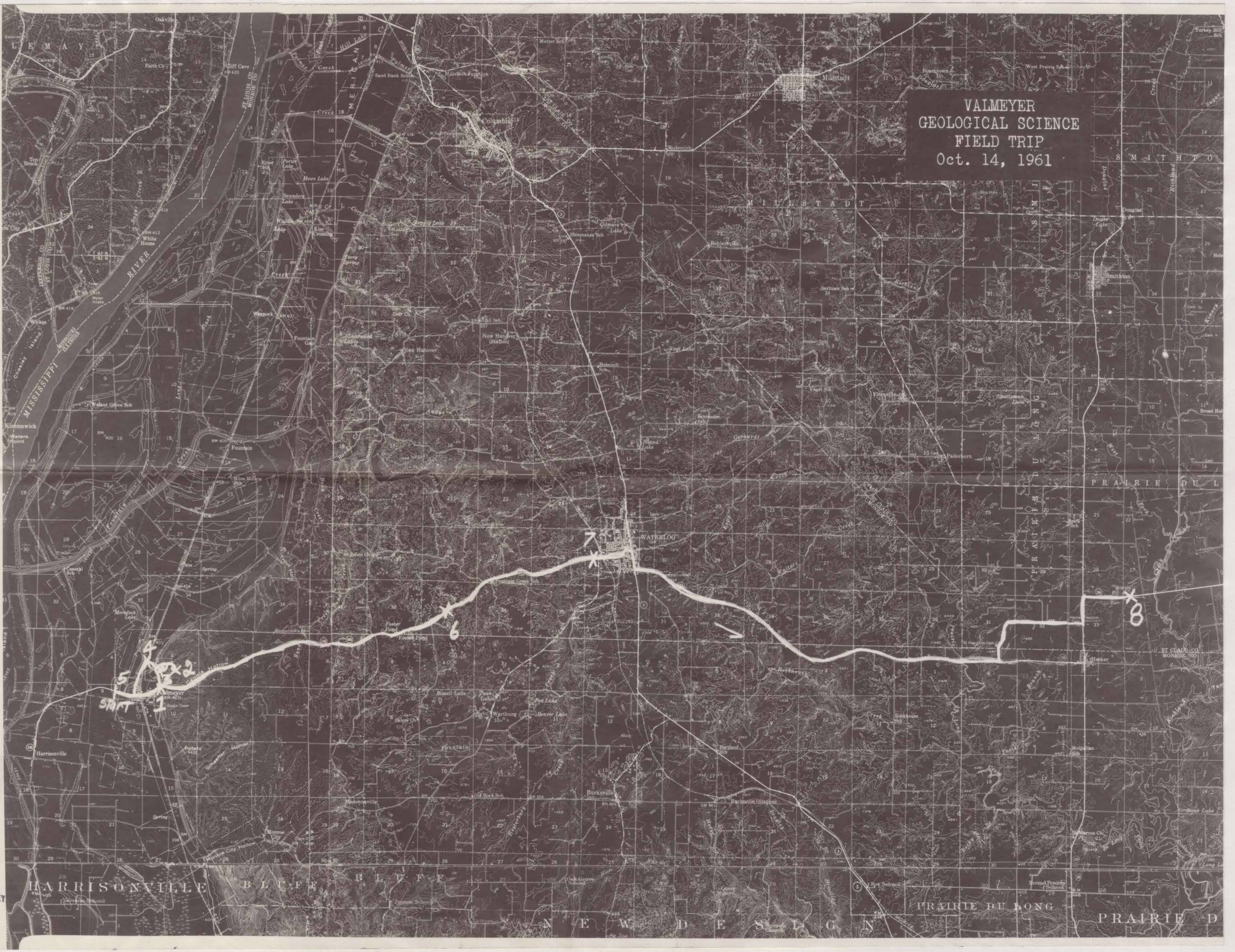
COMMON TYPES of ILLINOIS FOSSILS



COMMON TYPES of ILLINOIS FOSSILS




VALMEYER
GEOLOGICAL SCIENCE
FIELD TRIP
Oct. 14, 1961
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Millstadt
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Fountain
New Hanover
MISSISSIPPI
RIVER
HARRISONVILLE
BLUFF
PRAIRIE DU LONG
PRAIRIE DU L
NEW DESIGN
MILLSTADT
SMITHTO
LEMAY